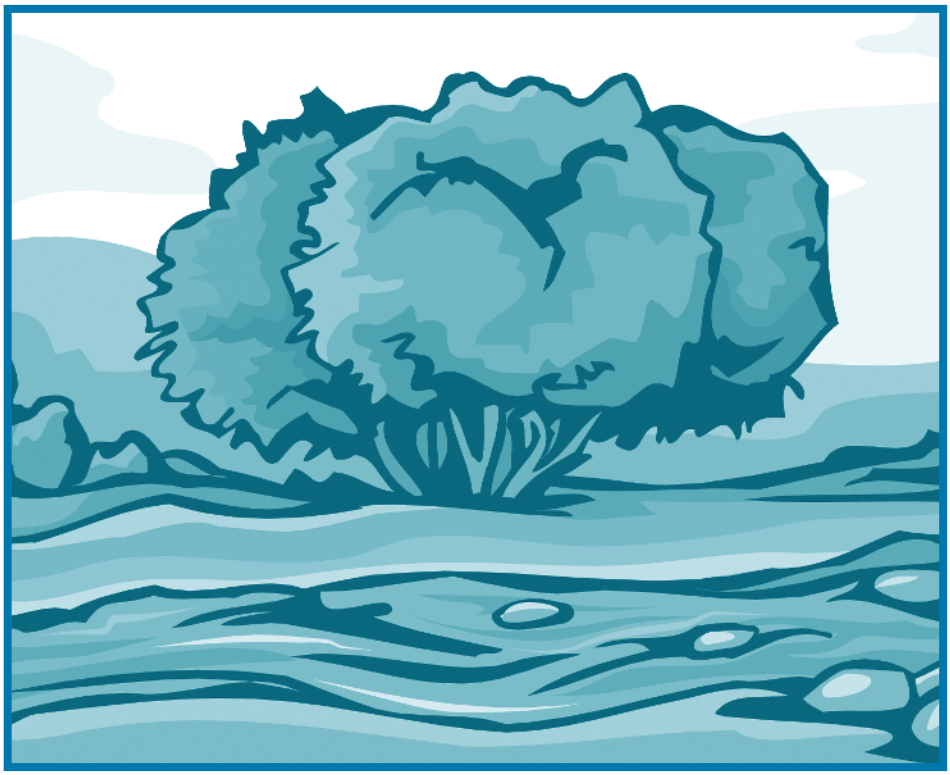
LOCAL OFFICIALS' RESOURCE SERIES

UNDERSTANDING WASTEWATER REGULATION IN VIRGINIA



Guide for Local Government Leaders

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The Virginia Municipal League is a statewide, nonprofit, nonpartisan association of city, town and county governments. Established in 1905, the league commits itself to improving and assisting local governments through legislative advocacy, research, education and other services. The membership includes 39 cities, 156 towns and 13 counties.

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Understanding Wastewater Regulation in Virginia

Guide for Local Government Leaders

Virginia Municipal League

Virginia Water Environment Association

Understanding Wastewater Regulation in Virginia

By The Virginia Water Environment Association Government Affairs Committee

About the authors:

The Virginia Water Environment Association, Inc. (VWEA) is a member association of the Water Environment Federation. Its mission is to preserve and enhance Virginia's water environment, now and for future generations. VWEA's objectives are:

- The advancement of fundamental knowledge of the water environment, its basic quality and the physical laws governing its interaction with other aspects of the environment and with the aesthetic, economic, and biological needs of the earth's inhabitants.
- The advancement of practical knowledge in the technology, design, construction, operation, and management of water quality control systems and facilities.
- The increased understanding of the nature and function of the earth's natural waterways, surface, subsurface, and atmosphere, and encouragement and promotion of action necessary to preserve and enhance them.
- The implementation of the objectives previously stated through an exchange of information and experience among its members, and other interested persons, by an annual meeting, seminars or other activities for its members.
- The publication and distribution of information relating to the water quality control field.
- The promotion of public understanding and the encouragement of sound regional policy in matters relating to the water quality control field.
- The improvement of the professional status of all personnel engaged in any aspect of the water quality control field, including but not limited to the design, management and operation of water quality control systems.
- The stimulation of public awareness of the relationship of water resources to the general public welfare, and the need for preservation and reuse of water resources.
- The advancement of the education of its members and other interested persons by the presentations of, technical programs at its annual meetings, seminars, workshops and other meetings.
- Affiliation with the Water Environment Federation and participation in the activities of the organization.

The Government Affairs Committee is involved with tracking and reporting federal and state legislation that may have an impact on the wastewater industry in Virginia. We also write and submit articles for the quarterly *Conduit* regarding local policies, new or proposed legislation, and other topics dealing with regulation. The committee in responsible for developing a session at the annual VWEA conference for Government Affairs, whereby state officials, regulators and policy makers are invited to speak on topics of interest in the wastewater field.

Dear Colleague:

Municipal public works and utilities have more of an effect on the health and vitality of a community than almost any other facility or service. Cleaning and protecting Virginia's waters is an important and enormous task. Virginia local governments have worked with state and federal agencies over the past 30 years to protect healthy waters and restore impaired ones by sharply reducing pollutant discharges and by financing municipal wastewater treatment facilities. Such actions help achieve the broader goal of restoring and maintaining the chemical, physical and biological integrity of our waters so that they can support the protection and propagation of fish, shellfish, wildlife and recreation. Wastewater treatment also contributes to the economic health of a community by providing opportunity for residential and business expansion.

Local elected officials have a difficult job. They are responsible for operating and maintaining a community's sewerage system, planning for future needs and ensuring that systems operate in compliance with increasingly complex and stringent regulations, while maintaining affordable rates. In addition, local elected officials must accomplish this in an era where both the federal and state governments have limited money available to assist localities with the rehabilitation of existing systems or mandated improvements.

Virginia's locally elected officials can provide the leadership to continue these critical investments in our natural environment, economy and quality of life. This handbook has been prepared to help them learn more about wastewater regulations in the Commmonwealth.

Sincerely,

French H. Moore Jr.
President, Virginia Municipal League
Vice Mayor, Town of Abingdon

Kevin C. Wood, P.E.
President, Virginia Water Environment Association
Director of Engineering
Loudoun County Sanitation Authority

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Chapter 1: Introduction

Modern American society places great importance on protecting the environment. In response to this, political leaders have placed increasing demands on the federal, state and local governments to improve environmental protection. As a result, environmental regulations are constantly evolving, becoming more complex, challenging and costly. Regulations for the collection, treatment and disposal of wastewater are no exception to this general trend.

Regulators have the difficult job of balancing the protection of the environment that society demands with competing interests such as private property rights, farming, timber, economic development, and compliance costs. In Virginia, federal and state government regulators administer most environmental regulations related to the collection, treatment and disposal of wastewater. While the federal and state governments promulgate the majority of the wastewater regulations, responsibility for implementing or complying with these regulations most often falls to a local government.

Local elected officials have an equally difficult job. Localities must be concerned with public health and safety, water quality issues and asset maintenance. This responsibility comes at a time when federal and state government funding is declining, and regulatory requirements are increasing.

This handbook has been prepared to help elected officials learn more about wastewater regulations in Virginia. It describes the legal and historical context of these regulations and looks at important wastewater topics, including collection systems, industrial pretreatment and biosolids management. The handbook also addresses Virginia's Chesapeake Bay program, the state's new nutrient standards and nutrient trading. A list of resources for local officials is included, as well as a handy guide to frequently encountered abbreviations.

Chapter 2: Legal Background

History of Clean Water Act

Federal water legislation dates back to the 19th century, when Congress enacted the River and Harbor Act of 1886, re-codified in the Rivers and Harbors Act of 1899. Recognizing the threat that dirty water posed to the public health and welfare, Congress enacted the Federal Water Pollution Control Act (FWPCA), in order to "enhance the quality and value of our water resources and to establish a national policy for the prevention, control and abatement of water pollution."

The original FWPCA was passed in 1948 and was amended in 1956, 1965, and 1966, which each time expanded federal authority. Despite the improvements achieved by each amendment to the original Act, the result of this legislation was a hodgepodge of law. Eleven reorganizations and restructurings of federal agency responsibility compounded the difficulty of effectively implementing the law. To solve these problems, the 1972 amendments to the FWPCA restructured the authority for water pollution control and consolidated authority in the Administrator of the Environmental Protection Agency (EPA). In 1977, this law was again amended and became known as the Clean Water Act (CWA).

Before the Clean Water Act, water quality in many parts of the country was deplorable. Raw sewage and industrial waste were routinely dumped into rivers, lakes and coastal waters. Many of America's waterways had become places to avoid. The Hudson River contained bacteria levels of 170 times the safe limit. The Cuyahoga River in Ohio actually caught fire. And the Mississippi was in serious decline. There was no method in place to effectively control the pollution that was fouling America's waters. The Clean Water Act passed both houses of Congress by overwhelming, bipartisan margins. By any measure, this landmark legislation has been hugely successful.

The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the United States by making it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. A common example of a point source discharge is a discharge from a municipal wastewater treatment plant to a river, lake, or ocean. Section 402 of the Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) permitting system to control point source discharges. The Clean Water Act also contained requirements to set water quality standards for all contaminants in surface waters.

In addition, the CWA funded the construction of sewage treatment plants under the construction grants program. Revisions to the Act in 1981 streamlined the municipal construction grants process, improving the capabilities of treatment plants built under the program. However, in 1987 revisions phased out the construction grants program and replaced it with the State Water Pollution Control Revolving Fund, more commonly known as the Clean Water State Revolving Fund. This revolving fund provides only low interest loans for the construction of treatment facilities. The trend of federal dis-investment in local water infrastructure continues to this day.

Clean Water Act Enforcement in Virginia

The Clean Water Act sets the legal framework for detailed regulations. The EPA has the responsibility of establishing regulations to meet the requirements of the Clean Water Act. Many states, including Virginia, have been given primacy over these programs. The State Water Control Board and the Department of Environmental Quality (DEQ) under the State Water Control Law and Virginia Pollutant Discharge Elimination System Permit (VPDES) regulations manage these programs in Virginia and use the permitting process to enforce environmental mandates. Accordingly, anyone wishing to discharge wastewater in Virginia must apply and secure a VPDES permit. This permit is the state's primary vehicle to control and enforce protection of the water environment. It carries the weight of, and is enforceable through, both federal and state laws and regulations. The EPA maintains authority to review applications and permits for "major" dischargers – those facilities with a design discharge of one million gallons per day or greater.

State Water Control Board

The Virginia State Water Control Board was established in 1946 to regulate wastewater discharges into Virginia's rivers. After the passage of the Federal Water Pollution Control Act in 1972, the State Water Control Board became the delegated Commonwealth of Virginia agency to administer the Clean Water Act. When established, the State Water Control Board included citizen members and staff. In 1992, the Virginia Department of Environmental Quality was created and incorporated the State Water Control Board staff. The State Water Control Board, however, continues to have responsibility for administrating Virginia water control law. The State Water Control Board is made up seven Virginia citizens appointed by the governor, based on merit without regard to political affiliation. The State Water Control Board adopts regulations and considers special orders resolving violations of its regulations and permits. Virginia law requires the State Water Control Board to meet at least four times per year. Day-to-day administration of the board's programs is delegated to the DEQ.

Chapter 3: Wastewater Treatment Regulations

Wastewater Permits

The State Water Control Board issues individual discharge permits to wastewater facilities, termed Virginia Pollution Discharge Elimination System (VPDES) permits. Permit requirements, special conditions, effluent limitations and monitoring requirements are determined for each facility on a site-specific basis in order to meet applicable water quality standards. VPDES permits have an effective date of not longer than 5 years.

Fees are assessed to recover a portion of the costs associated with the processing of permit applications. The fees include an application fee and an annual maintenance fee. Application fees are payable with the permit application.

The first step in establishing a permit is to assess the water body that is to receive a wastewater discharge. Water bodies are assessed for criteria such as:

Use Designation: Defines by regulation the primary uses for a water body (e.g. swimming, fishing, consumption etc.). Water bodies are categorized based on water quality and ability to support designated uses. Category I waters support all uses while Category V waters are considered impaired and thus, require augmented protection.

Water Quality Standards: Are developed via detailed water quality analysis with the goal of determining a pollutant's impact on the plants and animals in a given body of water. These standards, which are adapted by regulators, are the basis of developing the discharge limitations defined in a VPDES permit.

Load Allocations: Once a water quality standard has been developed, specific allocations are established for a wide range of pollutants so that the water quality standard can be met. Load refers to the number of pounds of pollutant that are discharged to a water body over a specific period of time such as pounds per day or pounds per year. A load allocation is the amount of pollutant that a water body can safely assimilate over a period of time.

Once a water body has been evaluated, a VPDES permit can be drafted. The first section of a permit typically includes detailed limitations on what can be discharged into the receiving water body. A "boilerplate" section follows, detailing items that pertain to all permits. Items such as the right of inspection and reporting criteria are included in this section. The permit is validated by a fact sheet, which describes how the limitations were established. This part of the process is very technical and often includes complex computer modeling. Typical examples of permit parameters include:

Dissolved oxygen: a direct measurement of the amount of oxygen available for organisms to use for respiration.

Biochemical oxygen demand (BOD5): tests the strength of wastewater based on the combined oxygen demand of chemical and/or microorganisms; this test is a five-day test.

Total suspended solids: quantifies the amount of solids in water determined by filtration.

Bioassay: a "catch-all" test where specific organisms (e.g. fathead minnows, water fleas) are exposed to a wastewater and the impact on mortality and reproduction is measured.

Metals: pollutants such as lead, copper, mercury etc. that can cause environmental damage.

Flow: typically, the amount of the discharge on a daily basis. Flow is important as it is used to determine pollutant load discharged by the facility.

Disinfection: treatment required of most wastewater plants (e.g. chlorine, ultraviolet light etc.) to kill bacteria and disease causing organisms; accordingly most permits include parameters that measure adequate disinfection.

Nutrients: nitrogen and phosphorous are of major environmental concern; while they are not toxic, excessive nutrients can lead to algae blooms and abnormally high oxygen demands.

Once the DEQ determines what pollutants to limit, a VPDES permit is drafted. The draft permit is submitted to the applicant and the EPA for review. The Code of Virginia, Section 9 VAC 25 Chapter 15, authorizes a procedure for resolution of disputes between the permittee and the State Water Control

Board. The procedure includes selection of a mediator. It is important to note that dispute resolution can only take place during the preparation of a permit application or permit modification, not after the permit is issued. Despite the availability of this procedure, it is far more common for disputes to be resolved by informal negotiation.

After changes are incorporated into the draft permit based on comments from the applicant or EPA, the draft permit is advertised and public comment is solicited. Depending on the nature of the public comments, a public hearing may be held on the permit. In any case, comments received are reviewed by the DEQ and, if appropriate, modifications are made to the draft permit. The State Water Control Board will then be asked to take action on the permit. The State Water Control Board can issue the permit as recommended by the DEQ, approve a modified permit, or not issue the permit. An application to renew a VPDES permit must be submitted six months prior to the permit expiration date. All conditions of the permit are reevaluated each time the permit is renewed.

Compliance and Enforcement

Compliance and enforcement are integral to the permit once the permit is official. Permit holders are required to analyze their facility's discharge on a regular basis and explain any conditions that are out of compliance. The Discharge Monitoring Report is an EPA-established reporting mechanism that most VPDES permit holders must submit on a monthly basis. The DEQ has a division whose responsibility it is to monitor these reports and act if noncompliance becomes a concern. Penalties for not meeting permit limits vary greatly. The DEQ has a point system that triggers an official notice of noncompliance if warranted. While minor infractions do not typically provoke action by the DEQ, chronic or severe violations will result in sanctions. Penalties can range from a fairly benign Letter of Agreement to heavy monetary fines and judicial dictates.

A commonly used judicial tool is the Consent Order. A Consent Order dictates specific steps the permittee must take to come into compliance. Typical elements of a Consent Order include requirements for improvements, interim effluent limits, time tables to achieve compliance, penalties, and provisions to be taken if the Consent Order is not followed. The goal of a Consent Order is not necessarily to penalize the permit holder but rather to force improvement.

Chapter 4: Collections systems

Infrastructure Issues

Wastewater collection systems fall into two broad categories: separate sanitary systems, and combined sanitary and stormwater systems. Storm water collection and conveyance systems are also of concern to localities. With all types of systems, localities must be concerned with public health and safety, water quality issues and asset maintenance.

Separate Sanitary Systems

Sanitary collection systems consist of street sewers, larger interceptors and any pump stations necessary to convey wastewater to publicly owned treatment plants (POTW). Generally, municipalities own the street sewer, while property owners are responsible for the service lateral on their property, although this varies by locality.

When flow escapes the collection system, the event is called a Sanitary Sewer Overflow (SSO). SSOs can threaten public health and water quality by allowing untreated sewage into basements, streets and streams. SSO events must be reported to the DEQ by phone within twenty-four hours of the event and a follow up letter must be submitted within five days. Recently, both the Virginia DEQ and the federal EPA, have been taking increased enforcement action in SSO cases.

Many localities are developing capacity management, operation and maintenance (CMOM) plans to prevent SSOs to the maximum extent practicable. These CMOM plans include requirements for capacity studies to insure that systems are designed adequately, and operation and maintenance plans to insure that the systems perform as designed. At the time of this writing, final CMOM regulations have not been promulgated but regulators do have the authority to take action against localities deemed to have excessive SSO events.

The two most common causes of SSOs are line blockages and excessive flows. Blockages are generally caused by root intrusion or buildups of fats, oils and greases (FOG). Most municipalities have ordinances prohibiting excess discharge of FOG and require restaurants to install and maintain grease traps. Even where these ordnances are strictly enforced, some cleaning of sewers is required to prevent SSOs caused by blockages, and tree roots still need to be controlled.

Rain-driven high flows are also a cause of SSOs. Excess water can enter sanitary sewer systems from groundwater entering through cracks in pipes, joints and manhole barrels. This is called infiltration. Rainwater can also enter from sources such as roof gutters and basement sumps connected directly to sanitary sewers. This source is called inflow. Together, infiltration and inflow (I&I) can cause extreme peaks in sanitary sewer flows. These peaks can exceed by ten times the normal sanitary flow and overwhelm treatment systems, causing basement backups and SSOs from manholes or other escape points in the sewer system. Excess I&I can also negatively impact treatment efficiency at the wastewater plant. While inflow ceases shortly after the rain stops, infiltration due to elevated groundwater can continue for long periods after rain events. In some cases, such as when sewers are placed below the normal groundwater level, infiltration is continuous.

Regularly scheduled sanitary sewer system evaluations should be performed to determine the condition of the system and the vulnerability to inflow. System evaluations are a critical part of asset management and valuation. New accounting practices require public entities to report asset condition and valuation as defined in the GASB 34 standard.

Most evaluations are performed by floating a closed circuit television (CCTV) camera on a skid through the line to inspect for cracks and pipe deterioration. Combined with geographic information systems (GIS), CCTV inspection plans can be developed into sophisticated tools for assessing system conditions and making long-term capital improvement plans for asset rehabilitation and, if need be, replacement. Trenchless techniques for rehabilitating sewers systems such as slip-lining sometimes allow extensions of the useful life of sewers at lower cost and disruption than replacement. Keeping a system of buried assets operating at design capacity requires regular ongoing renewal and replacement.

While inflow can often be controlled by maintenance of municipally owned assets under the streets,

infiltration is more problematic. Modern ordinances generally prohibit the connection of area drains, downspouts and sump pumps to sanitary sewers in new construction. However, these were common practices in the past and correcting inflow problems can be politically sensitive. Also, it can be difficult to document and require a private property owner to make repairs to deficiencies on the portions of the service lateral found on private property. Many communities have developed innovative methods to help property owners come into compliance with modern codes including grants and tax credits for property improvements.

Combined Sewer Systems

Combined sewer systems are systems in which both wastewater and stormwater are collected. In Virginia, only the cities of Richmond, Lynchburg and Alexandria are known to have combined systems. These combined sewer systems are designed to overflow to rivers and streams whenever there is significant rainfall. Combined Systems Overflows (CSO) systems require a separate permit from the DEQ. CSO permits require nine technology-based minimum controls and a long-term control plan that includes water quality impact considerations.

Stormwater Permits

In 2004 the Virginia General Assembly transferred permitting authority for municipal separate storm sewer systems (MS4) and construction related activities to the Department of Conservation and Recreation (DCR).

Stormwater collection systems catch runoff from impervious surfaces such as roofs, roads and parking lots and convey the flow to receiving streams. In the past, stormwater runoff received scant attention. However, increased concern with nutrients, sediments and toxics has led to increased regulation. Under the federal Clean Water Act, large municipalities (those with a population more than 250,000) were required to be covered by Phase I MS4 NPDES permits. Phase 1 MS4s require a comprehensive Stormwater Management Program (SWMP) of structural and non-structural measures to control the discharge of pollutants from the storm sewer system to the maximum extent practicable, and to effectively prohibit non-stormwater discharges to the separate storm sewer system. The Phase 1 permits require the implementation of the SWMP, storm event monitoring, and regular assessments of the SWMP effectiveness.

Phase 2 MS4s are required for medium municipalities (where population is more than 100,000 but fewer than 250,000) and for small municipalities located in urbanized areas, as defined by the U.S. Census Bureau's 2000 Census. Small municipal separate storm sewer systems include systems owned by municipalities, federal facilities, state facilities (including VDOT), and public universities. In addition, any small municipal separate storm sewer system located in a Phase 1 large or medium municipality is required to be permitted under the Phase 2 regulations.

Permits for regulated small municipal separate storm sewer systems require the development, implementation and enforcement of a SWMP that includes the following six minimum control measures: (1) public education and outreach on stormwater impacts, (2) public involvement/participation, (3) illicit discharge detection and elimination, (4) construction site stormwater runoff control, (5) post-construction stormwater management in new development and redevelopment, and (6) pollution prevention/good housekeeping for municipal operations.

Regulated small municipal separate storm sewer system permit applications require the applicant to identify: (1) proposed best management practices and measurable goals for each of the six minimum control measures; (2) the timing of the implementation of each control measure; and (3) the person or persons responsible for implementing the SWMP.

Chapter 5: Industrial Pretreatment

Federal and state laws require municipalities to develop industrial pretreatment programs in communities with wastewater treatment facilities greater than 1 million gallons per day and/or with industries that have the potential to impact the operations of wastewater treatment plants. Specific industries, termed categorical industries, must be regulated. Also, specific flow rates, expressed in million of gallons per day or as a percent of the plant flow, trigger local regulation. Any industry with the potential for pass-through, treatment inhibition or biosolids contamination must be controlled through a local permit and implementation of pollutant reduction activities.

Pass-through means that a pollutant can move through the treatment works in sufficient quantity to cause water quality violations in the receiving stream. While municipal treatment works are very sophisticated and often remove 90 to 99 percent or more of the conventional pollutants for which they were designed, they often do not remove high levels of some metals and toxic organics. If these substances pose a threat to water quality, they must be controlled at the industrial source.

Most municipal treatment plants rely on the high efficiency of biological systems to treat wastewater. However, toxic effects from industrial sources can upset treatment systems and inhibit treatment efficiency. Treatment processes including conventional activated sludge, biological nutrient removal and solids processing digesters are all subject to inhibition.

Nationally, about 60 percent of the solids produced from wastewater treatment facilities is beneficially reused through some form of land application to agricultural or forest lands. Properly treated, these biosolids are excellent soil amendments and a rich source of nutrients. Regulations govern the concentration of metals and toxics in biosolids used for land application. If industrial sources threaten to raise levels above the allowable limits, they must be controlled through a pretreatment program. While less restrictive, landfill disposal and incineration of biosolids also have limits on pollutants.

One of the key tasks of a pretreatment program is to develop local limits for allowable pollutants from industry. There are national categorical baselines for some industries but in most cases local limits must be developed. These limits must take into account the background levels from domestic sources, the type of biological units in use and their susceptibility to inhibition, and the method employed for biosolids disposal. Local limits must be defensible both to the regulated industries and to state and federal environmental agencies.

After developing local limits, the locality is charged with writing permits for industries that define how they will comply with the limits. Industries have a range of options for compliance including pollution prevention, waste minimization and, if needed, on-site treatment. The locality must inspect facilities and take samples to insure compliance with the permit it issues.

Localities usually have additional sewer use ordinances for the protection of public health and safety. These ordinances control the introduction to the sewer system of corrosive agents that could cause sewer failure, flammable substances such as gasoline that could cause explosions and other toxics that could be a threat to municipal staff or the general public. Fats, oils and grease are often prohibited in quantities that could cause blockages within the system and lead to sanitary sewer overflows.

Chapter 6: Biosolids Management

Description

Biosolids and residuals are byproducts of wastewater treatment plants. Biosolids consist of primary and waste activated solids, which have been processed to reduce pathogens, and are often used for beneficial programs such as agricultural or forest land application. Residuals are products such as grit, scum and incinerator ash, which are removed from the treatment plant, and are typically disposed of at landfills.

Legislation

Biosolids first came under federal regulation with 40 CFR Part 257 in the 1970s. In 1987, the Federal Clean Water Act (CWA) was amended by the addition of Section 405 to govern the disposal and use of biosolids. This also included a comprehensive program to reduce potential environmental risks and to maximize beneficial uses of biosolids. Following evaluation of numerous pollutants contained in typical biosolids in 1993, the EPA promulgated the major federal biosolids regulations at Part 503, which superseded the earlier Part 257 regulations.

Part 503, Subpart B sets pollution limits for metals including arsenic, cadmium, copper, lead, mercury, nickel, and zinc and sets forth management practices, reporting and record keeping requirements. Definitions also were created for Class A and Class B land applied biosolids. Class A biosolids must be void of detectable pathogen levels and must meet vector attraction reduction requirements. A vector is an organism, often an insect or rodent, that carries disease. Class B biosolids may contain low levels of pathogens and are managed accordingly, while also meeting vector attraction reduction requirements. Public and local officials sometimes assume that Class A biosolids are a far safer product, and that imposing further restrictions or bans on Class B biosolids will minimize risks. However, the federal regulations and EPA policy do not express a preference between Class A and Class B biosolids treatment.

Disposal of biosolids in municipal landfills is regulated under 40 CFR Part 258 and the Resource Conservation Recovery Act (RCRA), Subpart D for criteria for non-hazardous municipal solid waste landfills that accept biosolids. Under these criteria, biosolids can be approved by the governing state agency as a cover material in landfills. About 17 percent of biosolids generated from municipal wastewater treatment plants nationwide is disposed of in municipal landfills. Typically state and local solid waste management regulations also are applied to biosolids acceptance in landfills. This means that biosolids and residuals often must meet minimum requirements for level of quality and solids content.

Public Health and Concerns

Managing biosolids to minimize environmental and health risks has been the focus of hundreds of university research studies conducted for many years. The results of this extensive research show that biosolids can be managed so that the risk of adverse environmental or public health effects from land application of biosolids is extremely low.

The National Research Council of National Academy of Sciences performed research in 1996 on land application. The published report concluded that the removal of pollutants by wastewater treatment plants and existing regulations governing use of biosolids in crop production were sufficient to protect human health and the environment, and presented negligible risk to consumers of crops grown in biosolids-applied lands. The EPA manual "Control of Pathogens and Vector Attraction in Biosolids" was published in 1999, and in the 2002 report, "Biosolids Applied to Land: Advancing Standards and Practice," the National Academy concluded that there was no documented scientific evidence that the 40 CFR Part 503 rule failed to protect public health.

Site restrictions and buffers can help address public concern about the health and safety of biosolids land application. Virginia has established site-specific biosolids management practices that go above and beyond the EPA's Part 503 Rule. The site restrictions take into account items such as soil conditions; proximity to ponds, lakes, rivers or groundwater; drainage patterns, and fertilizer requirements for crops. Buffers set minimum distances between the biosolids application site

and streams, wells, dwellings, roads and property lines. While all biosolids must meet federal and state standards for safety, the requirements for buffers provide an extra layer of protection to prevent negative environmental impacts, minimize public exposure and reduce potential nuisances.

State and Local Control Over Biosolids

The CWA allows for states and their political subdivisions to enact and enforce requirements for wastewater discharges, provided the state requirements are not less stringent than the federal requirements. Individual state biosolids management programs typically impose requirements on municipal wastewater treatment plants (such as material quality) and land appliers (such as site approval criteria).

In Virginia, the Department of Health and the Department of Environmental Quality administer comprehensive biosolids land application permit programs. The Virginia Supreme Court ruled in 2001 that localities may not chart local ordinances that conflict with or undermine Virginia's comprehensive statewide program.

Since then, the General Assembly has expanded local authority to address specific issues, while maintaining a uniform statewide program. Counties can now pass a local biosolids ordinance, assign a monitor and test for environmental impacts. Local biosolids monitoring activities can include reviewing permits, site inspections, verifying sign notices and buffer distances, and collecting samples and testing, among others. The cost of the local monitoring program is reimbursed to the county by the Department of Health if the county's ordinance is approved by the agency.

Chapter 7: Receiving Waters Issues

Over the past eight years, the biggest receiving water issue in Virginia has been dealing with nutrient discharges (nitrogen and phosphorus) from both point and non-point sources, primarily in the Chesapeake Bay watershed. These issues culminated with legislation and regulations to control the discharge of nutrients from point source dischargers. Non-point source discharges of nutrients are mostly unregulated, and remain under a voluntary implementation program through the Department of Conservation and Recreation.

Chesapeake Bay Program

The Chesapeake Bay has suffered from low dissolved oxygen and nutrient enrichment for decades. An over-abundance of nitrogen and phosphorus over fertilize the bay, causing algae blooms, which in turn block light to underwater grasses. Excessive algal growth also causes low dissolved oxygen when the algae die off and drop to the bottom, depleting oxygen through the decaying process.

In 1983, the Chesapeake Bay Program was initiated as a multi-governmental partnership between the states of Virginia; Maryland; Pennsylvania; Washington, D.C.; the Chesapeake Bay Commission, a tri-state legislative body; and the EPA. The governors of each state, the mayor of the District of Columbia, the EPA administrator, and the Chesapeake Bay Commission chairman make up the Chesapeake Executive Council, which has been directing the Bay restoration since 1983.

(a) 1987 Chesapeake Bay Agreement

The bay clean-up efforts were refined by a 1987 Agreement, which committed the signatories to:

"Develop, adopt, and implement a basin-wide strategy to equitably achieve by the year 2000 at least a forty percent reduction of nitrogen and phosphorus entering the main stem of the Chesapeake Bay. The strategy should be based on agreed upon 1985 point source loads and on non-point source loads in an average rainfall year."

Further evaluations found that the James, York, and Small Coastal basins contributed little, if any, to the dissolved oxygen deficit in the main steam of the bay. So Virginia's strategy focused on the Potomac basin to meet the forty percent goal and expanded the monitoring and modeling programs in the lower tributaries to determine the appropriate nutrient reduction goals for each river basin.

(b) 2000 Chesapeake Bay Agreement

In 2000, the Chesapeake Executive Council signed a new comprehensive Bay Agreement titled "Chesapeake 2000, A Watershed Partnership," which commits to "achieve and maintain the water quality necessary to support the aquatic living resources of the bay and its tributaries and to protect human health" by 2010. This agreement sets a different approach to improving bay water quality. It bases success on attaining water quality standards and criteria, and not just pollution load reductions.

Computer simulations were analyzed to determine nutrient and sediment allocations. The resulting allocations call for a reduction in the amount of nitrogen entering the bay from the current 277 million pounds per year down to 175 million pounds, and phosphorus reductions from 19.4 million pounds per year to 12.8 million pounds.

Allocations were divided between the participating states and became cap loadings. Cap loadings are the largest amounts of nutrients and sediment that can be discharged annually to the bay by a particular state. Virginia's allocation is 51.4 million pounds per year of nitrogen, 6 million pounds per year of phosphorus, and 1.94 million tons per year of sediment. To allocate the loadings down to the local level, the Department of Environmental Quality developed Tributary Strategies for each of its five river basins that flow to the bay, the Potomac, Rappahannock, Eastern Shore, York and James.

To meet Virginia's nutrient reduction commitments, the State Water Control Board in 2005 assigned load allocations for nitrogen and phosphorus to the larger existing point sources, those with permitted capacities of more than 500,000 gallons per day. An allocation for future facilities was not reserved, so new plants or plant expansions will need to obtain a load allocation from another source. The adopted allocations were based on anticipated plant

capacity as of December 31, 2010. Most existing wastewater treatment plants will require treatment upgrades to meet their load allocations.

The non-point source reduction goals call for BMPs or best management practices to be installed and maintained on 92 percent of available agricultural lands, 85 percent of mixed open lands, 74 percent of urban lands and 60 percent of septic systems. Non-point source controls are difficult to implement and maintain, because so many different controls are required on land owned and maintained by thousands of landowners, land managers, federal, state and local governments, and others. Also, no regulatory mechanism exists to require or enforce implementation of these controls.

(c) Nutrient Water Quality Standards/ Regulations/Issues

Total Maximum Daily Loads

By 1998 nutrient enrichment was still a problem in the bay, so the EPA proposed implementation of a Total Maximum Daily Load (TMDL) regulatory program. A TMDL is a study of a water body that determines the sources of contamination affecting water quality and assigns allocations that must be met for the water body to achieve water quality standards. Most of Virginia's portion of the bay and its tidal tributaries was placed on the federal list of impaired waters because they failed to meet standards for dissolved oxygen and aquatic life use attainment.

Under a consent decree between the EPA and two national environmental organizations, many TMDLs for impaired waters are being developed within Virginia. If Virginia does not meet the schedule contained in the decree, the EPA is required to establish the TMDLs. However, with the Chesapeake Bay Agreement in place, TMDLs are not required for the bay and its tributaries until at least 2010.

Water Quality Standards

One of the key elements of the 2000 Chesapeake Bay Agreement was to define water quality conditions necessary to protect aquatic living resources. In 2005, the Virginia DEQ adopted revised water quality standards to address nutrient and sediment based pollution in the Chesapeake Bay and its tidal tributaries. These standards or criteria are based on:

Water Clarity: ensures that enough sunlight reaches underwater grasses that grow on the bottom in most shallow areas. Submerged aquatic vegetation (SAV) acres will be the first method of assessment for determining attainment of the water clarity criteria. In the standards, each river basin was assigned a specific number of acres that should be maintained or restored within that basin.

Dissolved oxygen: ensures that enough oxygen is available at the right time during the right season of the year, to support aquatic life, including fish larvae and adult species. The standards regulation establishes five subcategories of designated use for the Chesapeake Bay and its tidal tributaries – migratory fish spawning and nursery, shallow water SAV, open water aquatic life, deep-water aquatic life, and deep channel seasonal refuge. These new designations allow the application of adequately protective dissolved oxygen criteria. By implementing water quality criteria specific to the natural conditions and habitats, the standards will be more effective in achieving water quality improvement goals for these waters.

Chlorophyll a: the pigment contained in algae and other plants that enables photosynthesis. Optimal levels reduce harmful algae blooms and promote algae beneficial to the bay's food chain. Of the standards adopted, the one that was most controversial was the chlorophyll standard for the James River. All other river basins in Virginia were given a narrative chlorophyll standard, but in the James, numerical standards were developed. To meet these numerical standards, nitrogen and phosphorus from point and non-point sources must be reduced by upgrading treatment, or installing best management practices.

If the new water quality standards are not met by 2010, EPA may develop a formal TMDL.

Water Quality Management Plans

To tie the Chesapeake Bay Agreements, Tributary Strategies and Water Quality Standards together, the DEQ revised the Water Quality Management Planning Regulation and Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed.

The Water Quality Management Planning (WQMP) Regulation sets the annual point source nutrient waste load allocations in each of the bay's major tributary basins. These allocations cap the

amount of nitrogen and phosphorus that point source dischargers in the bay watershed can discharge. The DEQ set nutrient allocations for every major discharger in the bay watershed.

The Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed provides for the control of discharges of nutrients from point sources affecting state waters that are designated nutrient enriched waters or are located within the Chesapeake Bay watershed. This regulation, along with the WQMP, constitutes the nutrient reduction requirements for point source discharges in the Chesapeake Bay watershed.

The regulation also incorporates changes in nutrient reductions requirements that were enacted by the 2005 General Assembly through the new Nutrient Credit Exchange (Nutrient Trading) legislation. This legislation and regulation allow for the issuance of a General Permit for nutrient reductions. They also set technology based requirements for existing, expanding, new, significant and non-significant dischargers.

(d) Effects of Chesapeake Bay Program

Through the 2005 Nutrient Credit Exchange legislation, point source dischargers into the Chesapeake Bay and its tributaries will be issued a VPDES General Permit to implement the waste load allocations assigned by the WQMP Regulation. This allocation essentially becomes a cap on the discharge of nutrients by the point source.

Since the allocation is based on design flows for the wastewater treatment facility, once the facility reaches its design capacity, no additional expansions will be allowed without further reductions in the nutrients being discharged.

The cost of meeting the limit of technology or state-of-the art nutrient treatment will be expensive for the rate payers of Virginia localities that discharge to the Chesapeake Watershed. The estimated costs to meet point source allocations set by the 2005 WQMP Regulation are $1.5 billion.

The estimated costs to meet the nutrient allocations from point and non-point sources are approximately $10 billion. Therefore, non-point sources will need approximately $8.5 billion in order for the bay to meet water quality standards and be considered a healthy water body. As stated earlier, non-point source controls are difficult to implement and maintain, because of the variety of controls required on land owned and maintained by thousands of landowners, land managers, federal, state and local governments, and others.

Meeting Nutrient Standards/ Regulations

To address the costs associated with meeting such stringent nutrient requirements, the General Assembly enacted two important pieces of legislation, the Water Quality Improvement Act and the Nutrient Credit Exchange program. The legislation was designed to provide assistance with the costs of meeting nutrient standards and to help address growth issues.

(a) Water Quality Improvement Fund

The Water Quality Improvement Fund (WQIF) provides grants to be used toward the removal of pollutants from the Virginia's water bodies. There are non-point and point source programs. The point source program provides partial grants for the design and installation of nutrient removal facilities at publicly owned wastewater treatment facilities within the Chesapeake Bay watershed.

(b) Nutrient Credit Exchange Program

In 2005, the Virginia General Assembly established the Chesapeake Bay Watershed Nutrient Credit Exchange Program. This legislation was designed to assist treatment facilities in meeting the combined wasteload allocations under the State Water Control Board's new regulations cost-effectively and as soon as possible, while accommodating continued economic growth and development under the new nutrient cap allocations.

The legislation directs the State Water Control Board to issue a Watershed General Virginia Pollutant Discharge Elimination System (VPDES) permit, also known as the general permit, for dischargers of nitrogen and phosphorus in the Chesapeake Bay watershed. In addition to other elements, the general permit will include:

- Permit limits for total nitrogen and total phosphorus expressed as annual mass loads.

- A schedule requiring compliance with the combined wasteload allocations (WLAs) for each tribu-

tary as soon as possible while taking into account a number of relevant factors such as cost-savings from phasing multiple projects, the availability of required services and skilled labor, and the availability of funding.

- A requirement that within 9 months after the initial effective date of the general permit, permittees submit (either collectively or individually) a compliance plan identifying any capital projects and implementation schedules needed to achieve compliance with individual and combined WLAs. This compliance plan may rely on point-point trading at the permittee's option.

The State Water Control Board and the Virginia Department of Environmental Quality also adopted wasteload allocations that form the basis for permit limits for significant point sources in the Potomac-Shenandoah, Rappahannock and Eastern Shore basins. Allocations for significant facilities in the York and James basins are expected in 2006. Trading is generally limited to transactions between point (industrial and municipal) sources within the same river basin; however point-non-point trades are allowed for offsetting additional nutrient loads from new or expanded point sources.

To help achieve Virginia's nutrient reduction goals cost-effectively, the legislation authorizes permittees to establish the Virginia Nutrient Credit Exchange Association to coordinate and facilitate their participation in the exchange program. The association will assist permittees by:

- Submitting a compliance plan on behalf of a group of member permittees within a major river basin at their request;

- Developing nutrient credit trading agreements;

- Assisting permittees in identifying buyers and sellers of nutrient credits, and;

- Coordinating planning to ensure to the extent possible the availability of sufficient credits.

Future Water Quality Issues

(a) Persistent, Bioaccumulative Toxic Compounds

Persistent, bioaccumulative, toxic compounds (PBT) are a group of toxic, long-lasting substances that can accumulate in the food chain to levels that are harmful to humans and ecosystems. They tend to remain and increase in concentration in the environment and tissues of many kinds of organisms. PBTs are not removed or degraded at rates adequate to prevent their bioaccumulations in aquatic and terrestrial species. Tests indicate that many of these substances are toxic, as well as persistent and bioaccumulative. The well-documented deleterious effects of PBTs on wildlife are driving regulatory actions geared toward the prevention and elimination of these contaminates at their source.

(b) Pharmaceuticals and Endocrine Disrupting Compounds

Pharmaceuticals and endocrine disrupting compounds are chemicals that include human and veterinary drugs such as antibiotics, hormones, detergents, disinfectants, plasticizers, fire retardants, insecticides and antioxidants. Concerns about the environmental presence of these compounds include abnormal physiological processes and reproductive impairment, increased incidences of cancer, the development of antibiotic-resistant bacteria, and the potential increase in toxicity of chemical mixtures. Many household chemicals, pharmaceuticals, and other consumables as well as biogenic hormones are released directly to the environment after passing through wastewater treatment processes, which are often not designed to remove them. There are also few analytical methods capable of detecting some of these compounds at the low concentrations expected in the environment. Research is ongoing to determine the extent of environmental occurrence, transport and ultimate fate of many of these compounds.

Chapter 8: Resources

Other resources available to local governments looking for permitting, funding and enforcement assistance include:

Associations / non-profit organizations

Alliance for the Chesapeake Bay (Alliance) – www.acb-online.org

Chesapeake Bay Foundation (CBF) – www.cbf.org

Government Accounting Standards Board (GASB) – www.gasb.org

National Association of Clean Water Agencies (NACWA) – www.nacwa.org

Virginia Association of Counties (VACo) – www.vaco.org

Virginia Association of Municipal Wastewater Agencies (VAMWA)

Virginia Biosolids Council – www.virginiabiosolids.com

Virginia Municipal League (VML) – www.vml.org

Virginia Water Environment Association (VWEA) – www.vwea.org

Water Environment Federation (WEF) – www.wef.org

Water Environment Research Foundation (WERF) – www.werf.org

Governmental Agencies

Virginia Department of Conservation and Recreation – www.dcr.state.va.us

Virginia Department of Environmental Quality (DEQ) – www.deq.state.va.us

United States Environmental Protection Agency (EPA) – www.epa.gov

Chapter 9: Abbreviations

BMP ..... Best Management Practice

CCTV ..... Closed Circuit Television

CMOM ..... Capacity Management, Operation and Maintenance

CSO ..... Combined Sewer Overflows

DCR ..... Department of Conservation and Recreation

DEQ ..... Department of Environmental Quality

DMR ..... Discharge Monitoring Report

EPA ..... Environmental Protection Agency

FOG ..... Fats, Oils and Greases

GASB ..... Government Accounting Standards Board

GIS ..... Geographic Information System

I&I ..... Infiltration and Inflow

MS4 ..... Municipal Separate Storm Sewer System

NPDES ..... National Pollutant Discharge Elimination System

POTW ..... Publicly Owned Treatment Works

RCRA ..... Resource Conservation Recovery Act

SSO ..... Sanitary Sewer Overflow

SWCB ..... State Water Control Board

SWMP ..... Stormwater Management Program

TMDL ..... Total Maximum Daily Load

VPDES ..... Virginia Pollutant Discharge Elimination System

WLA ..... Waste Load Allocation

WQIF ..... Water Quality Improvement Fund

WQMP ..... Water Quality Management Planning

WQS ..... Water Quality Standards